

WHAT IS CLAIMED IS:

1. A method for preparing an aromatic bischloroformate mixture, the method comprising the step of:

combining one or more aromatic dihydroxy compounds with phosgene, a phase transfer catalyst, an aqueous solvent and an organic solvent under interfacial reaction conditions while maintaining the pH in the range of about 3 to about 8,

wherein the phase transfer catalyst is present in an amount that is effective for catalyzing a reaction between the phosgene and the one or more aromatic dihydroxy compounds until about 105 to about 150 mole percent of phosgene has been added based on the total moles of available hydroxy groups of the one or more aromatic dihydroxy compounds, thus producing an aromatic bischloroformate mixture.

2. The method of claim 1, wherein the pH is maintained in the range of from about 6 to about 7.

3. The method of claim 1, further comprising the step of sparging the aromatic bischloroformate mixture with a sufficient amount of nitrogen to remove any excess phosgene.

4. The method of claim 1, wherein the chain length of the aromatic bischloroformate is equal to or greater than 6.

5. A method for making a polycarbonate-polysiloxane copolymer, wherein the polycarbonate-polysiloxane copolymer comprises from about 0.5% to about 80% by weight of a hydroxyaryl-terminated polydiorganosiloxane, and wherein the hydroxyaryl-terminated polydiorganosiloxane has from about 10 to about 100 diorganosiloxy units, the method comprising the steps of:

(A) preparing a bischloroformate reaction mixture by combining a first portion of one or more aromatic dihydroxy compounds with phosgene, a phase transfer catalyst, an aqueous solvent and an organic solvent under interfacial reaction conditions while maintaining the pH in the range of from about 3 to about 8;

(B) adding a portion or all of the hydroxyaryl-terminated polydiorganosiloxane to the resulting mixture of (A), wherein the total hydroxyaryl-terminated polydiorganosiloxane is a sufficient amount to satisfy the desired polydiorganosiloxane weight percent requirements in the finally resulting polycarbonate-polysiloxane copolymer;

(C) adjusting the pH of the mixture forward in step (B) to a value in the range of about 10 to about 14 either before, or during after step (B);

(D) subsequently adding one or more of the remaining portions of the total amount of the one or more aromatic dihydroxy compounds, an aqueous solvent and an organic solvent;

(E) optionally repeating the addition of hydroxyaryl-terminated polydiorganosiloxane and/or aromatic dihydroxy compound until the total amount of the one or more aromatic dihydroxy compounds has been added and all of the hydroxyaryl-terminated polydiorganosiloxane has been added;

(F) allowing reaction to occur until 50 ppm or less of residual chloroformates remain;

(G) subsequently adding an agent selected from the group consisting of a chainstopper, a co-phosgenation catalyst and combination thereof, to the resulting mixture of (F); and

(H) adding a sufficient amount of phosgene to the resulting mixture of (G), while maintaining a pH of about 9 to about 12, to complete a reaction to form the polycarbonate-polysiloxane copolymer.

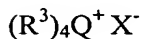
6. The method of claim 5, wherein the concentration of bischloroformate in step (A) is from about 0.05 to 0.3 M.

7. The method of claim 5, further comprising the steps of sparging the resulting mixtures of steps (A) and (H) with a sufficient amount of nitrogen to remove any excess phosgene.

8. The method of claim 7, further comprising the step of purifying and isolating the resulting polycarbonate-polysiloxane copolymer of step (H).
9. The method of claim 5, further comprising the step of adding a chainstopper to the mixture of step (A).
10. The method of claim 5, wherein the polycarbonate-polysiloxane copolymer has from about 0.5% to about 15% by weight of a hydroxyaryl-terminated polydiorganosiloxane.
11. The method of claim 5, wherein the pH of the mixture of step (A) is maintained in the range of from about 6 to about 7.
12. The method of claim 5, wherein the first portion of a total amount of the one or more aromatic dihydroxy compounds added in step (A) is about 10% to about 99%.
13. The method of claim 5, wherein the first portion of a total amount of the one or more aromatic dihydroxy compounds added in step (A) is about 20% to about 50%.
14. The method of claim 5, wherein the pH of the mixture of step (C) is adjusted to a value in the range of about 10.5 to about 11.5.
15. The method of claim 5, wherein the pH range of step (C) is maintained for a period of about 5 to 30 minutes.
16. The method of claim 5, wherein in step (F), the reaction is allowed to occur for sufficient time such that less than 1 ppm of residual chloroformates remain.
17. The method of claim 5, wherein in step (F), the reaction is not allowed to occur for a time sufficient such that hydrolysis begins to occur such that the molecular weight of the polycarbonate-polysiloxane copolymer is reduced.
18. The method of claim 5, wherein the pH of the mixture of step (H) is adjusted to a value in the range of about 10.5 to about 11.5.

19. The method of claim 5, wherein the polycarbonate-polysiloxane copolymer has a haze value below about 10%.

20. The method of claim 5, wherein the phase transfer catalyst is a chemical represented by the following formula:



where R^3 is a member selected from the same or different, $C_{(1-10)}$ alkyl groups, Q is nitrogen or phosphorus, and X is a halogen or an $-OR^4$ group, where R^4 is hydrogen, a $C_{(1-8)}$ alkyl group or a $C_{(6-18)}$ aryl group.

21. The method of claim 20, wherein the phase transfer catalyst is methyltributylammonium chloride salt.

22. The method of claim 5, wherein the amount of phase transfer catalyst added is 0.1% to 4 mol% relative to the one or more aromatic dihydroxy compounds added in step (A).

23. The method of claim 5, wherein the amount of phase transfer catalyst added is 0.25% to 2 mol% relative to the one or more aromatic dihydroxy compounds added in step (A).

24. The method of claim 5, wherein one of the one or more aromatic dihydroxy compounds is bisphenol A.

25. The method of claim 5, wherein one of the one or more aromatic dihydroxy compounds is 1,3-BHPM, 2,8-BHPM, or a combination of 1,3-BHPM and 2,8-BHPM.

26. The method of claim 5, wherein the one or more aromatic dihydroxy compounds is a combination of bisphenol A and BPI.

27. The method of claim 5, wherein the organic solvent is a chlorinated aliphatic hydrocarbon.

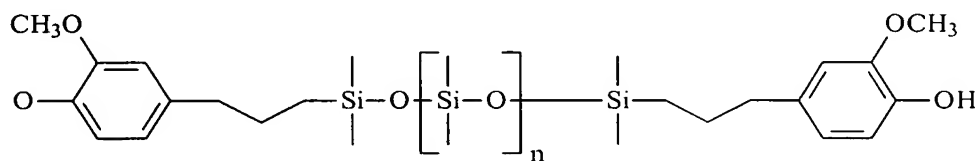
35. The method of claim 34, wherein the monohydroxy aromatic compound is phenol, p-butylphenol, p-cumylphenol, octylphenol, nonylphenol, or a combination of these.
36. The method of claim 5, wherein the co-phosgenation catalyst is a tertiary amine or a bisphenol.
37. The method of claim 36, wherein the tertiary amine is triethylamine.
38. The method of claim 5, wherein the polycarbonate-polysiloxane copolymer has a Mw of from about 13,000 to about 50,000 based on polycarbonate standards. The range may be 18,000 to 28,000 or 21,000 to 25,000.
39. The method of claim 5, wherein the chain length of the aromatic bischloroformate of step (A) is equal to or greater than 6.
40. The method of claim 6, further comprising the additional step of combining a polymer with the polycarbonate-polysiloxane copolymer, thus producing a blend.
41. The method of claim 8, further comprising the additional step of combining a polymer with the polycarbonate-polysiloxane copolymer, thus producing a blend.
42. The method of claim 8, further comprising the additional step of combining polycarbonate with the polycarbonate-polysiloxane copolymer, thus producing a blend.
43. A polycarbonate-polysiloxane copolymer prepared according to the method of claim 8.
44. The polycarbonate-polysiloxane copolymer of claim 43, wherein the polycarbonate-polysiloxane copolymer has a maximum haze value of 10%.
45. The polycarbonate-polysiloxane copolymer of claim 43, wherein the polycarbonate-polysiloxane copolymer has a Mw of about 13,000 to 50,000. Preferably, the Mw is 18,000 to 28,000 and preferably 21,000 to 25,000.

46. The polycarbonate-polysiloxane copolymer of claim 43, wherein the polycarbonate-polysiloxane copolymer has a Tg of about 140°C or more.

47. The polycarbonate-polysiloxane copolymer of claim 43, wherein the polycarbonate-polysiloxane copolymer has from about 1% to about 15% by weight of a hydroxyaryl-terminated polydiorganosiloxane.

48. The polycarbonate-polysiloxane copolymer of claim 43, wherein the hydroxyaryl-terminated polydiorganosiloxane comprises from about 20 to about 60 diorganosiloxy units.

49. The polycarbonate-polysiloxane copolymer of claim 43, wherein the polycarbonate-polysiloxane copolymer was prepared using bisphenol A and from about 1 to about 10% (2-methoxy-4-allylphenol)-capped polydiorganosiloxane having the following structure:



and wherein the polycarbonate-polysiloxane copolymer has a Mw of from about 18,000 to about 28,000.

50. The polycarbonate-polysiloxane copolymer of claim 43, wherein the polycarbonate-polysiloxane copolymer comprises about 5% by weight of a hydroxyaryl-terminated polydiorganosiloxane and has a Mw of about 21,000 to about 25,000.

51. The polycarbonate-polysiloxane copolymer of claim 43, wherein the polycarbonate-polysiloxane copolymer further comprises a sufficient amount of acid stabilizer to at least partly stabilize the haze of the polycarbonate-polysiloxane copolymer when it is dwell molded at 620° F for 10 minutes.

52. The polycarbonate-polysiloxane copolymer of claim 51, wherein the polycarbonate-polysiloxane copolymer further comprises less than 50 ppm phosphorous acid.
53. A polycarbonate-polysiloxane copolymer prepared according to the method of claim 39.
54. A blend produced according to the method of claim 40.
55. The blend of claim 54, wherein the blend has a haze value of less than about 10%.
56. The blend of claim 54, wherein the blend comprises polycarbonate-polysiloxane copolymer present in an amount sufficient to provide by weight, from about 0.5% to about 80% of polydiorganosiloxane. Preferably, 0.5 to 40% by weight.
57. The blend of claim 54, wherein the blend comprises polycarbonate-polysiloxane copolymer present in an amount sufficient to provide by weight, from about 0.5% to about 20% of polydiorganosiloxane.
58. A blend produced according to the method of claim 42.
59. The blend of claim 58, wherein the blend has a haze value of less than about 10%.
60. The blend of claim 58, wherein the blend comprises polycarbonate-polysiloxane copolymer present in an amount sufficient to provide by weight, from about 0.5% to about 80% of polydiorganosiloxane. Preferably, 0.5 to 40%? by weight.
61. The blend of claim 58, wherein the blend comprises polycarbonate-polysiloxane copolymer present in an amount sufficient to provide by weight, from about 0.5% to about 20% of polydiorganosiloxane.
62. The blend of claim 58, wherein the blend comprises by weight about 70% polycarbonate-polysiloxane copolymer and about 30% polycarbonate.

63. The blend of claim 62, wherein the blend further comprises a phosphite stabilizer and one or more colorants.

64. A polycarbonate-polysiloxane copolymer comprising:

bisphenol A subunits; and

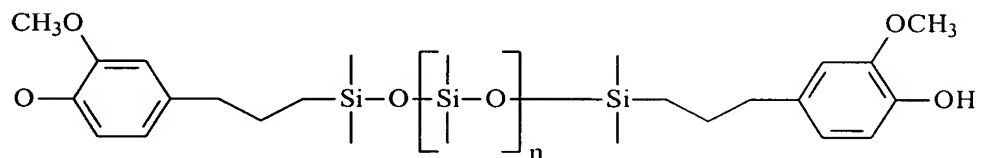
polydiorganosiloxane subunits, wherein less than 0.5 mol% of the polydiorganosiloxane subunits are directly coupled to another polydiorganosiloxane subunit.

65. The polycarbonate-polysiloxane copolymer of claim 64, wherein the bisphenol A subunits have a chain length of 6 or greater.

66. The polycarbonate-polysiloxane copolymer of claim 64, wherein the polycarbonate-polysiloxane copolymer has a haze value of 10% or less.

67. The polycarbonate-polysiloxane copolymer of claim 66, wherein the copolymer has a haze value of 10% or less, and wherein the copolymer when blended with a polycarbonate produces a blend that has a haze value that is less than the haze value of the copolymer.

68. The polycarbonate-polysiloxane copolymer of claim 66, wherein the polycarbonate-polysiloxane copolymer was prepared using bisphenol A and from about 1 to about 10% of a (2-methoxy-4-allylphenol)-capped polydiorganosiloxane having the following structure:



and wherein the polycarbonate-polysiloxane copolymer has a Mw of from about 18,000 to about 28,000.

69. The polycarbonate-polysiloxane copolymer of claim 66, wherein the polycarbonate-polysiloxane copolymer comprises about 5% by weight of a hydroxyaryl-terminated polydiorganosiloxane and has a Mw of about 21,000 to about 25,000.

70. The polycarbonate-polysiloxane copolymer of claim 66, wherein the polycarbonate-polysiloxane copolymer further comprises a phosphite stabilizer and one or more colorants.

71. The polycarbonate-polysiloxane copolymer of claim 66, wherein the polycarbonate-polysiloxane copolymer is prepared according to the method of claim 8.

72. The polycarbonate-polysiloxane copolymer of claim 66, wherein the polycarbonate-polysiloxane copolymer is prepared according to the method of claim 8.

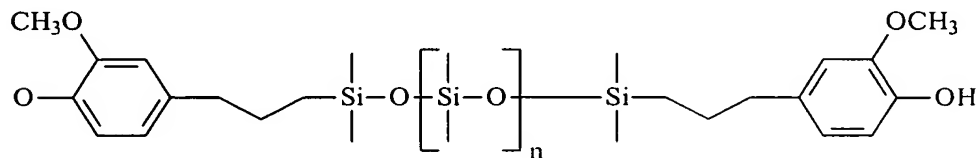
73. A blend produced by combining the polycarbonate-polysiloxane copolymer of claim 65 with a polymer.

74. A blend produced by combining the polycarbonate-polysiloxane copolymer of claim 66 with a polymer.

75. A blend produced by combining the polycarbonate-polysiloxane copolymer of claim 66 with polycarbonate.

76. A blend produced by combining the polycarbonate-polysiloxane copolymer of claim 64 with polycarbonate.

77. The blend of claim 75, wherein the polycarbonate-polysiloxane copolymer was prepared using bisphenol A and from about 1 to about 10% of a (2-methoxy-4-allylphenol)-capped polydiorganosiloxane having the following structure:



and wherein the polycarbonate-polysiloxane copolymer has a Mw of from about 18,000 to about 28,000.

78. The blend of claim 75, wherein the polycarbonate-polysiloxane copolymer comprises about 5% by weight of a hydroxyaryl-terminated polydiorganosiloxane and has a Mw of about 21,000 to about 25,000.

79. The blend of claim 75, wherein the blend comprises by weight 70% of polycarbonate-polysiloxane copolymer and 30% of polycarbonate.

80. The blend of claim 79, further comprising a phosphite stabilizer and one or more colorants.

81. The polycarbonate-polysiloxane copolymer of claim 80, wherein the polycarbonate-polysiloxane copolymer further comprises less than 50 ppm phosphorous acid, to at least partly stabilize the haze of the blend when it is dwell molded at 620°F for 10 minutes.

82. A shaped article formed from the polycarbonate-polysiloxane copolymer of claim 39.

83. A shaped article formed from the blend of claim 49.

84. A shaped article formed from the polycarbonate-polysiloxane copolymer of claim 43.

85. A shaped article formed from the blend of claim 54.

86. A shaped article formed from the polycarbonate-polysiloxane copolymer of claim 66.

87. A shaped article formed from the blend of claim 74.

88. A method for making polycarbonate-polysiloxane copolymer, which method comprises:

a) reacting a mixture comprising an aromatic dihydroxy compound, water, an organic solvent and phosgene in the presence of a phase transfer catalyst and the absence of a co-phosgenation catalyst while adding sufficient quantities of base to maintain the pH between 3 and 8 to form bischloroformate oligomer mixture;

b) adding to the bischloroformate oligomer mixture a hydroxyaryl-terminated polydiorganosiloxane and adjusting the pH (before or after said addition) by base addition to a range of from 10 to 14;

c) adding a second quantity of a dihydroxy compound;

d) allowing the polymerization reaction to proceed for a time sufficient to reduce the chloroformate level to less than 50 ppm but for a time insufficient to cause substantial hydrolysis of the polymer;

e) adding a chainstopper and a tertiary amine;

f) adding phosgene to complete the reaction and adjusting the pH to 9-11.

89. A method for making a polycarbonate-polysiloxane copolymer, which method comprises preparing bischloroformates by reaction together an aromatic dihydroxyl compound, water, an organic solvent and phosgene at a pH of from 3 to 8 in the presence of a phase transfer catalyst and the absence of a co-phosgenation catalyst, to form a chloroformate and subsequently reacting said chloroformate with a hydroxyaryl-terminated polydiorganosiloxane.

90. The method of claim 89, wherein the molar ratio of chloroformate endgroups to phenolic and endgroups on the hydroxyaryl terminated polydiorganosiloxane is greater than 4.
91. The method of claim 90, wherein the molar ratio is greater than 10.
92. The method of claim 91, wherein the molar ratio is greater than 30.
93. A polycarbonate-polysiloxane copolymer comprising monomer units derived from hydroxyaryl-terminated polydiorganosiloxane has from about 10 to about 60 diorganosiloxy units, the average chain length of the aromatic bischloroformate is 6 or greater, and haze value is less than 10.
94. The polycarbonate-polysiloxane copolymer of claim 93, wherein the haze value is less than 5.
95. A blend of a polycarbonate homopolymer and the polycarbonate-polysiloxane copolymer of claim 94 wherein the haze value is less than 5.